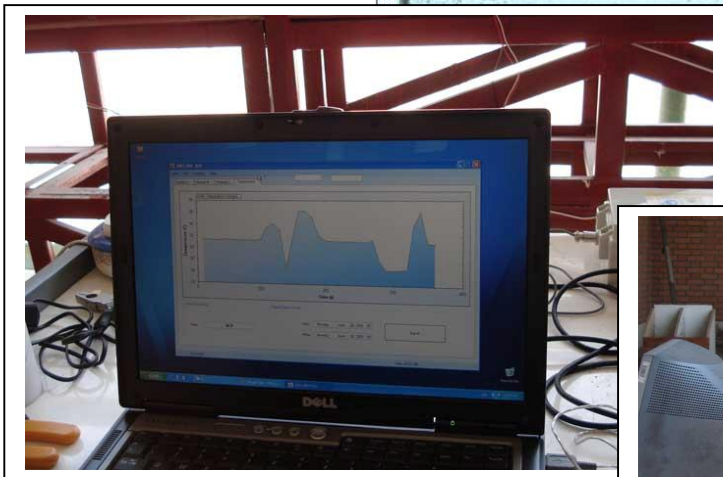


## IDRG URF-3CH ULTRASONIC RANGE FINDER



- ✓ 3-CHANNEL WATER LEVEL LOGGER
- ✓ INCLUSIVE SOFTWARE
- ✓ GRAPHICAL PRESENTATION
- ✓ ACCURACY: DEPENDS ON CALIBRATION
- ✓ RESOLUTION: 0.25 mm
- ✓ SAMPLING FREQUENCY: 50 Hz
- ✓ MEASURING RANGE: 150-500 mm

Manufactured by Irrigation & Drainage Research Group

<http://www.SoilWaterPlant.com>

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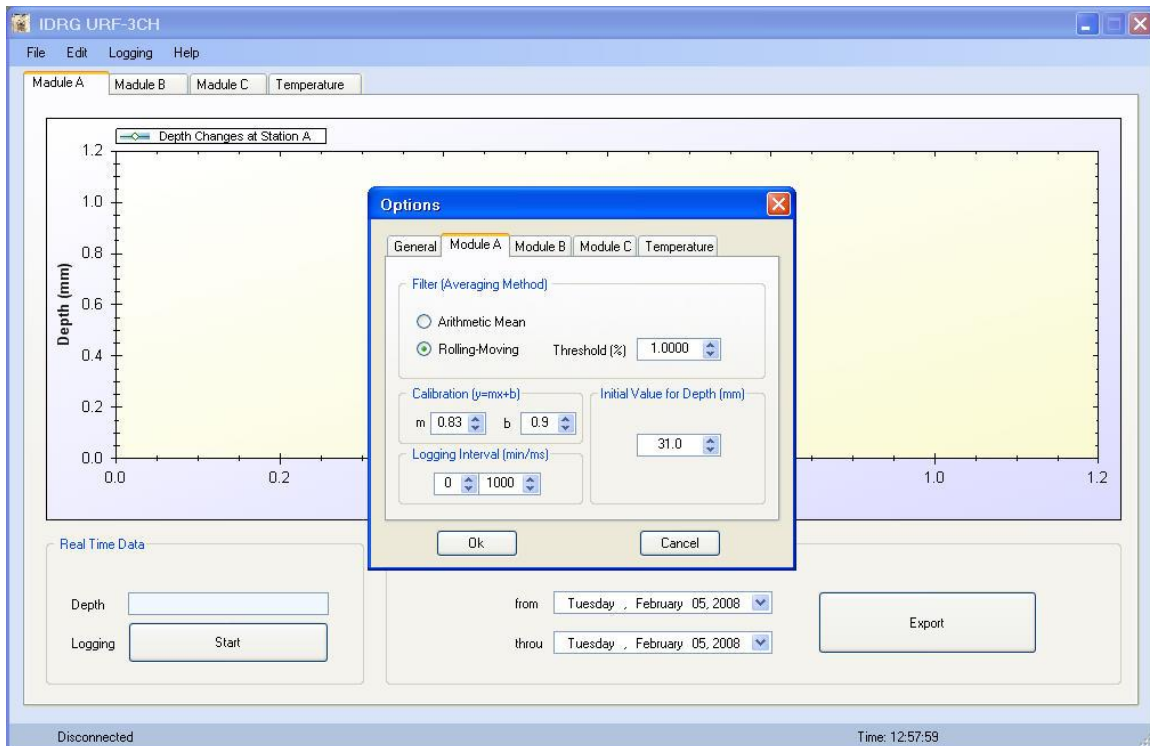
## Principle of Operation

The IDRG URF-3CH is a highly developed ultrasonic level measurement system which provides non-contacting level measurement for a wide variety of applications in laboratories. The ultrasonic pulses that are transmitted by a transducer are reflected of the water surface back to the sensor. The time taken to receive the reflected pulse is measured by the electronics. The elapsed time from the transmission to return is calculated distance between ultrasonic transducer and measuring product:

$$\text{Distance [m]} = \text{Travel Time} \times \text{Speed of Sound}$$

$$\text{The Temperature Compensated Speed of Sound [m/sec]} = 331.4 + 0.6 \times \text{Temperature}$$

## Software



### System Requirements:

Pentium III, 256 Mb RAM, 24Mb free hard disk space for installation files and at least 10Mb for data, WinXP/2000

### Installation:

Run Setup.exe from the companion CD and set the target folder and shortcut name. After software installation, please run it, connecting the RS232 cable to the device and your PC. Providing there is no problem, "Connected" will be appeared on the strip bottom the window. The system can now be programmed and used.

### Software Review:

#### A. Menu:

##### 1. File Menu

a. **Exit:** to exit the range finder software.

##### 2. Edit Menu

### a. Options

#### - General:

- § **Port Settings:** COM port number is set based on the port of PC to which RS232 cable is connected.
- § **Logging:** Enabling this option makes the program log range data (water level changes).
- § **Merlin:** Merlin is a narrator introducing the system. It appears whenever the software launches. You can disable this feature.

- **Module A/B/C:** for setting the properties of data manipulation (water level data obtained from each station).

- § **Filter:** To decrease the noise level of data an averaging method must be utilized. The Rolling-moving average is a recommended one, but placing an appropriate threshold value is of great importance depending on the hydraulic response of the system.
- § **Calibration:** Due to different factors affecting the precise installation of the ultrasonic modules over flume, data taken needs to be calibrated. A linear calibration method ( $y = mx + b$ ) might compensate for such source of error.
- § **Logging Interval:** specifies the frequency of logging. Minimum and maximum logging intervals are 100 ms and 100 minutes, respectively. Sampling frequency is different from the logging interval, having been programmed to be 50Hz.
- § **Initial Value for Depth:** This value is subtracted from range measured, taking the bottom of flume as the reference.

#### - Temperature:

**Filter:** To decrease the noise level of data an averaging method is required. The Rolling-moving average is a recommended one, but placing an appropriate threshold value is of great importance.

- § **Calibration:** Due to different noise sources, as well as an interaction between temp sensor and ultrasonic modules affecting the precise measurement of ambient temperature, data taken needs to be calibrated. The same as above, A linear calibration method ( $y = mx + b$ ) might compensate for most of errors.
- § **Logging Interval:** specifies the frequency of logging. Minimum and maximum logging intervals are 1 and 65 sec, respectively.

### 3. Logging Menu:

a. **Module A/B/C:** for starting a sampling process. The result would be plotted and/or logged in real-time depending upon the user's presetting.

b. **Restart the Application:** restarts the software. All variables are reloaded with their initial values.

### B. Module A/B Tab:

#### 1. Export Data to Excel

To export visualized data to Excel for further analysis.

## Hardware

### Computer Interface

A microcontroller-based unit activates three ultrasonic modules at their places on the top of flume by the control pulse. The travel time of ultrasound wave and ambient temperature measured are then used to calculate the distance from the water surface using the afore-mentioned formula.

#### Red LED (Power Indicator):

When you connect the interface to the power, after flipping the switch on, this LED turns on.

#### Connectors:

There are three connectors on the housing of the interface. Three of them are devoted to the ultrasonic modules and one to the temperature sensor which is separate from the others.

### Mounting Location of interface:

Please install the interface at the following places:

- 1) Where the temperature is within operating temperature range (-10 ~ +50°C).
- 2) Where the cable length between the sensors and interface is minimum.
- 3) Where easy to check the operation status.

Please avoid following places:

- 1) Any places of direct sunshine.
- 2) High voltage or high current nearby.
- 3) Where there is SCR (Silicon-Controlled Rectifier) Control Unit.



### Ultrasonic Module

The ultrasonic module should be mounted over the flume with the sensor facing downward somehow whose tip places at the distance 15 cm from the maximum water surface elevation. A clear path, free of any obstructions, must be provided between the sensor and the water surface. Due to the narrow sensor beam pattern, vertical-axis positioning of the sensor is important. The sensor must be installed so as to maintain perpendicularity to the water surface.



**Specifications:**

Model	US040015
Operation Frequency	40 – 45 KHz
Measuring Rate (max.)	50 Hz
Measuring Range	150 –500 mm
Protection Level	IP 65
Operation Temperature	-40° ~ +85°C

**Features:**

- Automatic frequency tracing minimizes temperature influence
- Water-proof construction
- Miniature size
- Flexible mounting

**Temperature Sensor**

The temperature sensor employed here is a sophisticated package with a digital output that drastically lessens noise effects.



**Most important features:**

- Absolute accuracy  $\pm .7$  °C
- Linear output within  $.2$  °C
- Calibrated on chip
- Temperature range 175 °C (-45 to +130 °C)

**Product Limited Warranty**

The IDRG URF-3CH is warranted to the original purchaser to be free from defects in materials and workmanship under normal installation, use and service for a period of one (1) year from the date of installation.

The obligation of our company under this warranty is limited to the repair or replacement (at our option), during the warranty period of any part which proves defective in materials or workmanship under normal use and service, provided the product is returned to us (address below the page).

This warranty gives you specific legal rights.

**Every effort has been taken to ensure the accuracy of this specification, however we do not accept responsibility for damage, injury, loss or expense resulting from errors and omissions, and we reserve the right of amendment without notice.**